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THE BROADENING HORIZONS OF MEDICINE[1]

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WE meet this morning in the midst of a troubled world, a world troubled perhaps more than it has ever been in the history of mankind. For ten years this country, along with the rest of the world, has been going through the throes of an economic depression of greater intensity and greater duration than any previously recorded, a depression which has disorganized commerce among nations and which has affected profoundly the lives of almost every one. During this same period of time we have seen many of the fruits of man's struggle for liberty sacrificed in the rise of political authoritarianism. The freedom of speech, the freedom of thought, the freedom even of physical movement, have been completely abolished in several portions of the globe. Fortunately this tide of authoritarianism has not yet engulfed this country; although it behooves every one to be on the alert, we need not fear that the ideals for which so many of our forefathers struggled will be easily given up. And now added to the depression and the rise of authoritarianism, we have before us the spectacle of war, a war which threatens the very foundations of civilization, and which is unleashing truly awful forces of aggression and hatred throughout the world. The troubled state of mankind and the inexpressible folly of war have seldom been summed up more pungently than in the words of Professor Albert Einstein in a letter addressed to posterity which was deposited a year ago in the five thousand year capsule at the New York World's Fair. The letter reads:

[1] Address presented at the opening session of George Washington University School of Medicine, September 25, 1939.

Our time is rich in inventive minds, the inventions of which could facilitate our lives considerably. We are crossing the seas by power, and utilize power also in order to relieve humanity from all tiring muscular work. We have learned to fly and we are able to send messages and news without any difficulty over the entire world through electric waves. However, the production and distribution of commodities is entirely unorganized so that everybody must live in fear of being eliminated from the economic cycle, in this way suffering from the want of everything. Furthermore, people living in different countries kill each other at irregular time intervals so that also for this reason anyone who thinks about the future must live in fear and terror. This is due to the fact that the intelligence and character of the masses are incomparably lower than the intelligence and character of the few who produce something valuable for the community. I trust that posterity will read these statements with a feeling of proud and justified superiority.

I hope that I may be pardoned for starting these few remarks with what may appear to be a pessimistic note. I have, however, stated the facts and hope further to use them perhaps as a backdrop against which the prospects of medicine may stand out a little more clearly and brightly in relief. To a psychiatrist the present troubled state of the world emphasizes more than ever before the need of a balanced mind in an unbalanced world; the need for confidence, for the use of intelligence, for the restraint of emotion. The need for sanity and for its application to the affairs of life has never been greater.

Many of those present here to-day are taking their first step or steps along the road which leads to the practice of medicine. The road is a difficult one. Even those who are present here to-day for the first time have already spent two years or more in college studying pre-medical subjects. They must spend four years of study, and not particularly easy study either, in the medical school, after which there will come a period of interneship before actual practice is essayed. I am one of those bold enough to question the wisdom of some of the required pre-medical work. There is a tendency to-day, I believe, to require specialism altogether too early and to leave out of the equipment of the medical man what were known in the old days as the humanities. Although the field of medicine has developed almost unbelievably, there are still, however, other things in life which make life worth living and to which the medical man should not be inattentive. Let us hope that the day is not gone forever when the field of medicine can produce such litterateurs as Oliver Wendell Holmes, S. Weir Mitchell, Sir William Osler and Harvey Cushing. I recommend as a decided contribution to that balanced mind of which I have spoken earlier the development of hobbies, of other interests to which one can occasionally flee from the practice of medicine. This is not to say that medicine itself has not many facets and many satisfactions. If those of us here did not believe that, we should not be practicing or study medicine to-day.

In the midst of a cynical world it is well occasionally to reaffirm one's faith in the existence of such a thing as altruism, the desire to serve one's fellow men. I may perhaps be pardoned another quotation by referring to the tribute paid to the physician by that brave spirit, Robert Louis Stevenson. The physician, as a rule, he comments, stands above the common herd, shares as little as any in the defects of a period and most notably exhibits the virtues of the race; he then goes on to say:

> Generosity he has such as is possible to those who practice an art, never to those who drive a trade; discretion tested by a hundred secrets; tact tried in a thousand embarrassments; and what are more important, Heraclean cheerfulness and courage. So it is that he brings air and cheer into the sick-room, and often enough, though not as often as he wishes, brings healing.

Perhaps at this time when much is being said as to the nature of medical practice, it is well to give some heed to what we mean by a learned profession as distinguished from a trade or business. The professional man is, or should be, something of an idealist. He is guided by the ideals of his profession, rules of conduct which have been handed down and which for instance are embodied for the medical man in the Hippocratic oath. The professional man is primarily a learned man, a man who depends upon his knowledge as his stock in trade. He has specialized knowledge over and above that of the common man in relation to some particular topic, be that law, theology, accountancy, teaching or medicine. Perhaps the thing that distinguishes him more than anything else is the peculiarly personal relation to the client or patient which he enjoys, a confidential relationship, a situation in which he is adviser, guide and friend, a situation in which his interest does not cease when the particular transaction is concluded. It follows as a corollary that he is an individualist, one who functions far more efficiently without regimentation or coercion, but rather requires the opportunity to utilize freely his own initiative and judgment within the limits of his professional code of ethics.

He has, too, an interest in the results of this relationship in which he is called to advise, which is over and above the cash recompense which he receives; in fact, in the practice of medicine it is all too often the case that no monetary recompense is received at all, and more frequently the recompense is wholly inadequate to the value of the services rendered. The physician does not consider that he is receiving a *quid pro quo* when he is paid by his patient. It is not that he sells his opinion at so much a yard. He is entitled to

living, yes, but more than that he takes a satisfaction in seeing that the results of his advice have brought aid and comfort to the person who sought it. Another feature is, or should be, the disregard of ed hours, the readiness to be of service whenever lled upon. It is a matter of regret to some of us the medical profession to see certain other professional aides at times somewhat disinclined to regard is fundamental principle of the profession. The ofessional man is not a "clock-watcher." He does t count on regular hours. He realizes when he kes up the study of medicine that his sleep will often interrupted, that his time will not really be his own, d he rejoices to feel that he may be called upon when hers are in need regardless of his own comfort. One her point of distinction may be mentioned, and that the principle as laid down in the Hippocratic oath at he will teach this art to others if they wish to arn it "without fee or stipulation." The physician, nd indeed any professional man, should emulate the lerk in the Canterbury Tales of whom Chaucer said: And gladly would he learn and gladly teach."

Such are a few of the distinctions which set off the arned professions, and particularly the profession medicine, from business. Our earliest prototype, e priest in primitive society, was the guide, counsel nd friend, the original professional man. We belong one of the oldest professions, and we may feel confident that when in years to come we prepare to retire rom active practice we may still be looked upon as the embers of a profession.

We have all been greatly pleased and deeply touched by the presentation this morning of the oil portrait of Dr. William Alanson White, the gift of the faculty to the school, and the few but eloquent words of Dr. Mallory which have accompanied this presentation. The faculty knew Dr. White well and some few of the student body probably came under his direct influence, though it is now two and a half years since he ceased to be among us. I like to look upon Dr. White as the ideal medical man. He embodied, certainly better and more fully than almost any one I have ever known, what we may look upon as the ideals of the physician. He was a student; he always wished to learn. He was a teacher, always happy in imparting his knowledge to others, a gift which he had in rare measure. He was deeply interested in the patient and desired first to understand the nature of the disorder. Whether or not he brought healing (and he often did bring about restoration to health), he always brought comfort. At the same time he remained a human being, a man in close touch with his fellow men, a man of wide and scholarly interests. To have known him is a benediction.

I shall speak later concerning Dr. White's influence on the development of psychiatry. For the present I should like to add a few words about the sphere of his personal influence and the devotion which he inspired in those who came into contact with him. It was a source of great personal satisfaction to Dr. White that the students of George Washington University School of Medicine, a school in which he had had a very close and vitalizing influence during his entire stay in Washington, a period of thirty-four years, showed not only a sufficient interest in psychiatry and its problems, but had sufficient personal respect and admiration for him to organize in this school the William Alanson White Society. This society was founded for the purpose partly of recognizing those students who had special interest and proficiency in psychiatry, and also for the consideration of what might be termed extra-curricular problems in psychiatry; that is, the broader applications of psychiatry to social problems. It is my earnest hope that this society will be long continued by the students as a tribute to the memory of this great man whom we are honoring to-day. Likewise, during Dr. White's life there was established in Washington the William Alanson White Psychiatric Foundation, which not only publishes a quarterly magazine entitled *Psychiatry,* but which is sponsoring this year for the first time a series of William Alanson White Memorial Lectures, to be given by an admirer of Dr. White and an outstanding psychiatrist, Dr. Harry Stack Sullivan, of New York. Such memorials to Dr. White are perhaps even more effective and closer to us than portraits such as this and such as the one which hangs at Saint Elizabeths Hospital. These portraits, however, are tangible reminders of the appreciation and affection which was felt for this fine physician, teacher and friend.

Certainly while we are paying tribute to the memory of Dr. White we should be remiss if we failed to remind ourselves likewise of another significant physician, a close personal friend and admirer of Dr. White who did much for this school. I refer, of course, to our late dean, Dr. Earl B. McKinley, an outstanding scientist, a man of high ideals, of great imagination and tremendous energy, who performed valuable services in developing this school to its present high plane of efficiency and reputation. His untimely death was a great loss to the cause of bacteriology, of medical education and this school. We all wish for our new dean, Dr. Bloedorn, the greatest of success in keeping George Washington University Medical School on the same high plane of standing. He may feel confident that the faculty shares his enthusiasm for the possibilities of the school and his desire to keep it a leader among the medical schools of North America.

If one were merely to enumerate the significant advances which have been made in medicine in the last century, he would have to be provided with a rather bulky book in which to record them. When

we consider that less than one hundred years ago the benefits of anesthesia, the germ theory of disease and consequently the possibilities of preventing infection were not known, you can realize that some of the very elementary items of modern-day practice are relatively new.

Consider the advances of bacteriology; the significant work not only of Morton, Lister and Pasteur, but more recently of Banting and his epoch-making development of insulin; the work of Theobald Smith and McKinley in bacteriology; the work of Folin in chemistry and of Cannon in physiology; the development of the knowledge of the vitamins and of the endocrine glands, and of surgery in all its aspects—and we have achievements worthy of record indeed. Perhaps even more important is the aspect of preventive medicine for which Walter Reed did so much. To-day diphtheria, typhoid and many other diseases are virtually unknown. New horizons are being discovered daily in the field of allergy, and indeed there is much reason to think that the work of medicine is just beginning. The pessimist may say that much has been discovered, that there is nothing more to discover. Such an attitude, of course, is far from the fact. Each discovery lays the groundwork of a group of further discoveries. How could we have all the wonders of radio and television to-day had it not been for the painstaking work of Marconi years ago?

There is a story going the rounds that a long time ago a Commissioner of Patents of the United States advised closing the Patent Office because everything worth-while had already been discovered. Being curious as to the basis of this story I appealed to my friend, Mr. E. W. Chapin, librarian of the Patent Office, and am indebted to him for giving me the actual facts upon which the story is based. As is so often the case, there was a little fire, although a great deal of smoke, and this story illustrates very well how stories grow. The study of gossip and its development, indeed, would make an interesting topic of discussion for psychiatrists. It appears that in the year 1843 the Commissioner of Patents said in his report: "The advancement of the arts from year to year taxes our credulity and seems to presage the arrival of that period when human improvement must end."

Let us not be deceived into thinking that human improvement is nearly ended. Heaven knows that there is ample room for much improvement in many fields, including that of the conduct of individuals and of groups. Much more is to be learned concerning the possibilities in the field of heredity and constitution. Much remains to be learned in the field of bacteriology with particular reference to the virus diseases and the development of biological tests. The field of chemotherapy is only beginning. The almost miraculous effects of sulfanilamide and sulfapyridine in the treatment of certain infections lead one to the belief th perhaps we may be on the path toward that dre of the old physicians, the *therapia magna steriliso* Surgery is on the threshold of new developments, a the development of the newer anesthetics in the fi of obstetrics has really revolutionized the practice that specialty within the past few years. There one field, however, on which medicine has hardly y begun—medicine is just discovering man! So mu in the past has been devoted to the parts of man, his various organ systems and to his specific functio that altogether too little has been thought about m himself, the social animal whose principal significan is his relations with other men. Dr. William A. Whi probably did more than any other medical man in th country to emphasize the importance of the individu the "organism-as-a-whole," as he called it, a somethi which is greater and more important than the sum all its parts, and indeed something different from t sum of its parts.

He emphasized the fact, now just beginning to b recognized in a general way, that the influences whi impinge upon one from the outside, as well as th conflicts which arise from one's unconscious, ha much to do with the physical functioning of the orga ism. To use Dr. White's own words, "The concept th considers the organism as a whole, and the necessa correlate thereto, that there is a psychological fact in every illness, bids fair to cause a revolution i medical thinking that will be of as great significan and as radical in its results as the revolution that h recently come about in the thinking of the physici and the astronomers."

Although the physical manifestations of embarra ment such as blushing have long been recognized, th analogue of blushing which might be exhibited in pa pitation or in spastic colitis as a result of emotion factors was overlooked. So much attention w focused upon the gastro-intestinal and circulatory tra that it was forgotten that they were parts of an ind vidual who was perhaps expressing in this particula way and by these particular symptoms his emotiona conflicts. The field of psycho-somatic medicine is i its infancy. It is encouraging to note recently i articles in the *Journal* of the American Medical Asso ciation moderately frequent references to the psych factors in disease; during the coming year it is planne that considerable attention will be paid to these factor in the clinical instruction given in this school. Dr White also emphasized what he called the languag of the psychoses; namely, the fact that even the ind vidual whose mental disorder is so marked as to requi his commitment to a mental hospital is endeavorin in his way to meet a situation and is, perhaps in a highly symbolic manner, attempting by what we ca his "jargon" to express what is going on in his mind

er all, our language is but a symbol anyway, whether be called psychotic or normal! Dr. White did ch through his early espousal of the teachings of ud to bring about an understanding of the uncon- us mental mechanisms. The existence of these hanisms is not denied to-day by many psychiatrists, numerous happenings in everyday life emphasize truth of the teachings of Freud. One of these ths, which may well be borne in mind in these lous times of international name-calling, is that re is no such thing as pure reason, but that emotion rs every act and thought. A prominent English chiatrist, Dr. Wilfred Trotter, has stated the case ently in a few telling words: "We can not separate the reasoning process as such and set it to work an emotional vacuum." He adds that if one says, am looking at it without prejudice," we may be e that the statement is untrue—"We should do well these occasions to inquire closely by what precise mechanism this supernatural purgation has been effected." A tremendous expansion in the psychiatric approach to medicine may confidently be looked for, and in this field we shall be constantly indebted to the contributions of Dr. White. Through his profound philosophical insight he adumbrated many things which have perhaps yet to be demonstrated, but as time goes on developments corroborate his keen intuition, aided by his scholarship and deep humanity.

We need have no fears that the development of medicine is at an end. Even though the world be troubled, we may confidently look for peace and satisfaction in the field of medicine, a field which is only at the beginning of possibilities of service and benefit to mankind. That medicine will continue as a profession in the hands of men possessed of individual initiative and of professional ideals, we likewise need have no doubt.

OBITUARY

HENRY CHANDLER COWLES

HENRY CHANDLER COWLES was born at Kensington, nn., on February 27, 1869. He died at his home in icago, Ill., on September 12, 1939, after a prolonged ess. He received his early education in the public ools and in the New Britain High School. He ered Oberlin College and was graduated with the gree of A.B. in 1893. He taught natural science at tes College during 1894–95, and held a fellowship the University of Chicago during 1895–96. His aduate studies were begun there in geology, but on the appointment of the late John M. Coulter as ofessor of botany, he became a member of the first up in that science at the University of Chicago. hile Cowles was a graduate student, the appearance Warming's celebrated text-book of plant ecology spired and guided him in becoming a pioneer leader ecology in America. He received the degree of ctor of philosophy in 1898, presenting as his thesis s classical paper on the vegetation of the sand dunes Lake Michigan. He then attempted to apply the inciples of dynamic vegetation, so evident in sand nes, to vegetation in general. The resulting "Physio- aphic Ecology of Chicago and Vicinity" formulated philosophy of vegetation in which the central prin- ple was that classification to be valid must be genetic d dynamic. In this monograph the concepts of suc- ssion and climax were for the first time adequately xpressed. The principles thus enunciated were so tal and so fundamentally important that scores of aduate students were later guided in their researches these two early publications.

In 1897 he became an assistant in the newly organized department of botany in the University of Chicago. From that time onward he was advanced repeatedly in rank until in 1911 he became professor, and in 1925 chairman of the department, a position he held until his retirement in 1934. In 1926 he became editor of the *Botanical Gazette,* a task in which he had assisted for many previous years and relinquished only at his retirement. His alma mater, Oberlin College, gave him the honorary degree of Sc.D. in 1923.

As a leader in plant science, particularly in dynamic plant ecology, he was enthusiastic but never dogmatic. He formulated no rigid system with complex classification and formidable new terminology, preferring to use non-technical language except when new ideas demanded new terms. From the beginning of his university work he was inspiring with facts, processes and principles, the basis of his stimulating teaching. He soon gathered about him a group of men and women who effectively spread the knowledge of dynamic ecology throughout the land. In 1914 the Ecological Society of America was organized, largely through the efforts of Cowles and his former students. One of these students, V. E. Shelford, now a leader in the field of animal ecology, became the first president of the new society. Cowles was its first secretary-treasurer, its president in 1917 and always a wise counselor regarding its welfare.

His world-wide leadership in the field of plant ecology was recognized in 1930, when at the International Congress, meeting at Cambridge, England, he was made president of the section of phytogeography and ecology.

In 1911 appeared the "Chicago Text Book of

Botany" in two volumes, afterwards expanded to three. Cowles contributed the volume dealing with ecology covering the branch of the subject known as autecology. In it, the theory of mechanical causation was stressed rather than teleology and adaptation which had previously been somewhat widely accepted.

No teacher brought his students more directly to nature than Cowles. Field trips, varying in length from one day to many weeks, inspired others to use the out-of-doors classroom. This led to his useful activities in all lines of conservation. No one was more influential than he in establishing the State Park system of Illinois and the Forest Preserves of Cook County, Ill. For many years he was president of the Chicago Academy of Sciences and a charter member and an active supporter of the Illinois State Academy of Science. He was also a patron and trustee of the Geographic Society of Chicago and president of the society for a term of years.

A member of many other scientific societies he served as president of the Association of American Geographers in 1910, as president of the Botanical Society of America in 1922 and vice-president of Section G of the American Association for the Advancement of Science in 1913.

In 1935 the July issue of *Ecology*, the official journal of the Ecological Society, was dedicated to Cowles by his students and friends. It was filled with articles from students and colleagues from America and from several European countries. From an appreciation of their friend and teacher, written for that issue of *Ecology* by W. S. Cooper, we quote the following paragraph:

"A man may be a great scientist and a great teacher and yet inspire in his colleagues and students little affection or none at all. With Cowles it was far otherwise. Something more than mere respect for high scientific attainment is necessary to account for the fact that, when the plan of this special number of *Ecology* was made public, more than three hundred persons responded. With almost every contribution came a letter expressing admiration for Cowles as a scientist, as a teacher, and above all, as a man. These facts speak for themselves; formal tribute is superfluous. And yet, merely because it is a joy to do so, we make mention of a few of his many lovable traits—his unfailing good humor, his far-famed ability in telling a story, his readiness to give ungrudgingly of time and effort in the service of students and friends, his eagerness to discover and commend whatever was meritorious in the work of a fellow scientist or admirable in the man himself.

"He relinquished his active labors secure in the consciousness of work well done, confident of achievement beyond the ordinary lot. He laid the foundation for a new and useful branch of science, he constructively influenced the thought of hundreds of investigators and teachers, and in his professional and personal contacts he made for himself a multitude of devoted friends."

GEORGE D. FULLER

THE UNIVERSITY OF CHICAGO

RECENT DEATHS AND MEMORIALS

JOHN ALLEN FULTON, director of the Mackay School of Mines of the University of Nevada, who at one time was Republican nominee for Governor of Nevada, died on October 9 at the age of sixty-one years.

DR. H. O. KNIGHT, professor and head of the department of anatomy at the University of Texas, died on October 5 at the age of fifty-eight years.

DR. ROBERT ALEXANDER CRAIG, since 1904 professor of veterinary science at Purdue University, died as the result of a motorcycle accident on October 12. He was sixty-seven years old.

JOHN STUART CAMPBELL, assistant professor of optics at the University of Rochester, died by suicide on September 26. He was thirty-five years old.

FREDERIC THEODORE BIOLETTI, professor of viticulture at the University of California, died on September 12. A correspondent writes: "He was one of a group of young men who in the 1890s at Berkeley developed under the influence of Professor Edward L. Greene a permanent interest in botany. He made many critical plant collections which have been cited in Engler's 'Pflanzenreich' and other works. His vocation was viticulture. In this subject he was for nearly fifty years instructor and professor in the College of Agriculture of the University of California, save for an interruption of two years' teaching in South Africa. He published many papers in his field."

A PICTURE of Dr. Warren P. Lombard, a member of the faculty of the Medical School of the University of Michigan from 1892 to 1923, was recently presented to the Medical School library in honor of his memory by a close friend, Colonel Ambrose Pack. Dr. Lombard was eighty-four years old at the time of his death last July. An obituary appreciation by Dr. Robert Gesell appears in the issue of SCIENCE for October 13.

SCIENTIFIC EVENTS

BIRD PROTECTION IN THE BRITISH EMPIRE

REPORTS on the present state of legislation for the protection of birds and its effectiveness in more than twenty different countries are printed in the fifth bulletin of the International Committee for Bird Preservation. The London *Times* gives an account of several relating to countries in the British Empire.

Writing of Australia, A. H. Chisholm expresses the opinion that lyre-birds, despite the fact that they lay only one egg in a season, are increasing throughout their range, which is from southern Victoria to southern Queensland. Certain other species, notably several beautiful parrots, have, however, decreased considerably, though, with the exception of the small varieties of emu, no Australian bird is known to have become extinct since the white occupation of the country. In Canada, according to Hoyes Lloyd, the insectivorous birds protected by the Migratory Birds Treaty with the United States are in no serious danger, and the attitude of children towards birds is, owing to better education, showing a great improvement. The shooting season for ducks and geese has since 1936 been limited to two months, and the shore-bird family is almost totally protected. The extension of bird sanctuaries has continued in Canada, but some of the prairie waterfowl sanctuaries are at present useless owing to drought.

E. V. Sanderson reports on the position in New Zealand, where the Forest and Bird Protection Society "is now a powerful and well-to-do organization." Unfortunately moose and other introduced mammals have done much damage by destroying natural vegetation in such reserves as the Fiordland National Park, which covers 2,600,000 acres. In New Zealand the upland game-birds have decreased greatly, leaving the grey duck to face most of the shooting, with the result that this bird is now becoming rapidly scarcer.

In an "informal report" on what is happening in South Africa, Dr. E. Leonard Gill says that wild birds seem to him to be better treated there than in most parts of the world, largely because in Africa sportsmen have shot big game and have not troubled much to shoot birds.

The bulletin also contains reports from Argentina, Mexico, Japan and many European countries, as well as the minutes of the meetings held at Rouen last year.

THE NEW MILFORD LABORATORY OF THE BUREAU OF FISHERIES

CONSTRUCTION of a new laboratory for the Fisheries Service at Milford, Conn., according to the bulletin issued by the service, is now under construction as a Public Works Administration project. When completed, it will serve as a center for oyster-cultural research for the New England area and may be used also for investigations on other aspects of fishery problems.

The new laboratory will be housed in a two-story, fireproof building, 70 by 35 feet, constructed of brick and cinderblocks. The building is to rest on yellow-pine piling driven 35 to 40 feet into the ground. The first floor will contain the director's office and laboratory, one laboratory room 21 by 16 feet, two small rooms for investigators, a room for meetings, lectures and displays, 22.7 by 22 feet, rooms for the heating plant and mechanical equipment, lavatories and a carpenter shop.

Chemical, physiological and biological laboratories, each about 23 by 16 feet, will be placed on the second floor, together with the chemical stock room, balance room, photographic room and library. All the laboratories will be provided with standard equipment, *i.e.*, gas, electricity, cold and hot fresh water, sea water, compressed air and the necessary furniture. The chemical room is to be equipped with standard chemical tables and two large fume hoods with forced draft. The sea-water system consists of a non-corrosive pump of suitable capacity, a large steel rubber-lined tank in the attic and lead pipes delivering the sea water to drain tables placed in each of the laboratory rooms. With the exception of the director's office and display room, the floors are of concrete covered with rubber matting. The building will be steam-heated by means of an automatic oil burner.

There will be a series of large concrete outdoor tidal tanks, about eight feet deep, built along the water line. Each tank is individually filled with sea water through tidal gates and the depth of the water can be maintained at three different levels. Seven of these tanks have been erected and have proved useful for keeping animals for various experiments.

Before designing the laboratory and selecting its equipment, a careful study was made of existing biological stations, and efforts were made to introduce the necessary up-to-date equipment, yet at the same time to avoid expensive structural features. This work benefited from a detailed examination of plans and buildings of the Marine Biological Laboratory and the Oceanographic Institution at Woods Hole, Mass. Many of the architectural features proving useful in these institutions were incorporated in the plans. To conform with its surroundings, the Milford Laboratory is of simple design and colonial in style of architecture.

The Bureau of Fisheries has conducted oyster investigations in Long Island Sound from headquarters at Milford for nearly twenty years. The work to be conducted in the new laboratory will be devoted principally to the study of improved methods of oyster culture, and special attention will be given to the possibility of controlling the propagation of oysters and other commercial mollusks.

THE THOMAS R. BAKER MUSEUM OF ROLLINS COLLEGE

LAST spring Rollins College received by deed from the City of Winter Park, Fla., a property known as the Aloma Golf Club to be developed by the college

as an enlarged and more useful Natural Science Museum. The property consists of a large and attractive building and three acres of land about one and a half miles from the college campus. The Club House was built in 1926 at a cost of about $35,000. It consists of a large room suitable for exhibition cases, a library, a curator's office and laboratory, shop room, rooms for storage and preparation of specimens, laboratory space for visiting biologists and living quarters for caretakers. While the museum is a division of Rollins College, the trustees have appointed a large committee, consisting of officers and faculty of the college and other local residents interested in the development of the museum, to manage its affairs. The present plans include development along the following lines: Exhibition of and information concerning Florida fauna and flora; development of a library of general treatises on natural history and also special papers dealing with Florida plants and animals; educational work with students of all ages and finally laboratory facilities for visiting biologists. It will depend for its support on gifts of which several have already been made. It will strive to be of service to the thousands of residents of Central Florida and others. Further information can be obtained from Edward M. Davis, curator, Rollins College, Winter Park, Fla.

G. G. SCOTT

MATHEMATICAL REVIEWS

A NEW international journal, to be known as *Mathematical Reviews,* will be edited at Brown University this year under the sponsorship of the American Mathematical Society, with the support of other learned and philanthropic organizations.

The Rockefeller Foundation has granted the university $49,500 for a micro-film laboratory to be set up in connection with the new journal and with the mathematics library of the university. Professor Otto E. Neugebauer, formerly editor of the *Zentralblatt für Mathematik,* and Professor J. D. Tamarkin, of the university, have been made editors; Dr. Will Feller will be assistant editor.

The journal is planned to "review all fields of pure mathematics," and will be published regularly in four languages—English, French, German and Italian. It is expected to be a clearing-house of information for teachers and research workers in all parts of the world.

The Carnegie Corporation has appropriated $60,000 for the journal, and the Rockefeller Foundation has pledged $12,000. The American Mathematical Society and the Mathematical Association of America have given $1,000 each. The micro-film laboratory will be used to copy rare mathematical material for Brown's mathematics library. Film copies of out-of-print journals and other publications will be available to mathematicians throughout the world. Films of any article reviewed in the journal will be sent to subscribers at cost.

THE UNITED STATES ANTARCTIC EXPEDITION

THE National Bureau of Standards reports that the United States Antarctic Expedition, which is expected to leave early in November, has need for many special kinds of devices and scientific apparatus. The various governmental agencies have been requested to cooperate with the members of the expedition to insure the accomplishment of the objectives. Because of the unusual conditions under which the scientific work must be done, special apparatus had to be designed for much of this work.

The bureau is supplying the equipment and apparatus for determining the temperature and density of the snow and ice at various depths. It is planned to install thermometers in the snow at the surface and at various depths down to 160 feet to determine not only the temperature at the various depths but also how these temperatures are influenced by the air temperatures during the different seasons. In addition, measurements will be carried out at different stations to determine the influence of the local topography on the subsurface temperatures.

The bureau is supplying 42 electric resistance thermometers and 2 wheatstone bridges with accessories, such as switches, extra galvanometers, etc. The instruments will be graduated from +10° to −70° C. (+50° to −94° F.). The thermometers will be located in holes about 2 inches in diameter. Especially designed drills for making the holes are being constructed in the instruments shops. Electric heating devices are also being provided to melt holes into the snow or ice, in case it is not possible to drill the holes to the full depth with the limited manpower available.

Apparatus and materials for determining the density of snow and ice and for determining the amount of communicating air spaces consist of the following: Balances; sampling devices for obtaining representative samples of snow; triethylbenzene to be used for filling the communicating air spaces in the density samples; and a number of density standards for determining the density of the various liquids, such as triethylbenzene, kerosene, etc., which will be used in determining the density of the snow.

Because it is difficult to estimate the accuracy which will be obtained with the apparatus at the extreme temperatures at which it will be used, numerous standards, such as resistance coils, freezing-point samples, masses, etc., are being provided for the purpose of testing and calibrating the apparatus under the conditions encountered in the Antarctic.

VISITING PHYSICISTS AT CORNELL UNIVERSITY

DURING the academic year 1938–39 and summer of 1939 reports by non-resident speakers were presented at meetings of the faculty and graduate students in physics at Cornell University as follows:

September 26—*Photo-conductivity and the Theory of the Latent Image*, Professor N. F. Mott, University of Bristol.

October 20—*The Philosophical Interpretations and Misinterpretations of the Quantum Theory*, Professor Philipp Frank, German University of Prague.

November 7—*Some Metallurgical Problems from a Physicist's Point of View*, Dr. S. Dushman, General Electric Research Laboratory.

December 1—*The Separation of Isotopes by Chemical Methods*, Professor H. C. Urey, Columbia University.

January 16—*Behavior of Matter under High Pressure*, Professor Edward Teller, George Washington University.

March 6—*Design and Construction of the Large Westinghouse Electrostatic Generator*, Dr. W. E. Shoupp, Westinghouse Laboratories.

March 20—*Cloud Chamber Studies of Cosmic Rays*, Professor J. C. Street, Harvard University.

March 27—*Proton Reactions*, Professor L. A. DuBridge, University of Rochester.

May 1—*High Pressure Research*, Professor P. W. Bridgman, Harvard University.

May 15—*The Self-energy of the Electron*, Dr. V. F. Weisskopf, University of Rochester.

July 31—*Problems of the Pick-up Tube in Television*, Dr. E. G. Ramberg, Research Division, Radio Corporation of America.

August 7—*Some Significant Developments in Nuclear Physics*, Professor S. W. Barnes, University of Rochester.

AWARD OF THE WILLIAM H. NICHOLS MEDAL

THE William H. Nichols Medal of the New York Section of the American Chemical Society has been awarded for 1940 to Dr. John M. Nelson, professor of organic chemistry at Columbia University, "for important contributions to the chemistry of life processes." The official statement of the jury of award reads:

Professor Nelson is an internationally recognized authority on the isolation and purification of naturally occurring enzymes and the quantitative study of their mode of action. He is the author of seventy-five papers in scientific journals, and has devoted the major portion of his research to determining the characteristics and activities of enzymes, substances which accelerate chemical transformations in nature—carbohydrates, the organic compounds manufactured by green plants, and valence, the quality which causes elements to react.

Professor Nelson is noted as an investigator of those complex chemical substances, the enzymes, by virtue of which life processes are carried on. They are the catalysts, the lubricants for the wheels of the vital mechanism. His work has been concerned with two of these enzymes: invertase, which is typical of those involved in the digestive processes of animals and in related processes in plant life; and tyrosinase, which is typical of those involved in the respiratory process. The latter process is a reaction related to combustion by which foodstuffs and air produce heat and mechanical energy.

Since Professor Nelson undertook his research work, chemists have shown that enzymes are proteins, either simple or complex. Consequently, much of the work that he has directed has been closely related to molecules of proteins, the fundamental building blocks in nature. Until 1934, his research was actively centered on invertase, the enzyme that occurs in the small intestine of mammals and in the tissues of certain animals and plants. His many publications on the activity of invertase and on methods for preparing highly active and purified preparations established him as one of the authorities on enzymes in this country.

In 1934 Professor Nelson became interested in problems concerning the utilization of molecular oxygen in plants and animals. The investigations of several groups of workers, largely European, have shown that the use of oxygen in many respiration processes occurs through a series of reactions in which two types of enzymes function—dehydrogenases and oxidases. The action of the former enzymes has been fairly well defined, but the functions of the latter are still the subjects for extensive researches.

During the past year Professor Nelson succeeded in obtaining a crystalline protein which has characteristics similar to tyrosinase, an oxidase. The importance of this development is apparent from the fact that although thousands of enzymes are known to exist, only about ten have been crystalized in a pure form.

Professor Nelson was born in West Point, Neb., on October 19, 1876. He was graduated from the University of Nebraska in 1901, and during the next two years he was employed as chemist for the Nebraska Food Commission. During 1903–04 he was instructor in chemistry at the Rose Polytechnic Institute, Terre Haute, Ind. He received the Ph.D. degree from Columbia in 1907. In 1907–08 he was instructor in the Rensselaer Polytechnic Institute.

He joined the Columbia faculty in 1908 as tutor, becoming assistant professor in 1915, associate professor in 1916 and full professor in 1922. He has had charge of the instruction of organic chemistry in Columbia College and has directed graduate research. The medal will be presented at a dinner of the New York Section on March 8, when Professor Nelson will speak on the various phases of the research in which he has been engaged.

The Nichols Medal was founded in 1902 by the late Dr. William H. Nichols, a charter member of the American Chemical Society and chairman of the

board of the Allied Chemical and Dye Corporation, to "stimulate original research in chemistry."

DR. AMES AND THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

PRESIDENT ROOSEVELT appointed George Jackson Mead, aeronautical consulting engineer, vice-president and director of the United Aircraft Corporation at West Hartford, Conn., to membership on the National Advisory Committee for Aeronautics to succeed Dr. Joseph S. Ames, who has been chairman of the committee or its executive body for twenty-four years and whose resignation because of ill health was accepted by Mr. Roosevelt "with sincere regret."

Mr. Mead was appointed for the unexpired term of five years from December 1, 1938, to which Dr. Ames was named last year. Dr. Ames advised the advisory committee in September that because of his physical condition he "could not in justice to the committee or to myself accept another term as chairman."

In his letter accepting the resignation of Dr. Ames, President Roosevelt said:

> Our republic would not be worthy of the devoted service you have rendered for over twenty-four years without compensation if it could not on this occasion pause to pay tribute where it is so justly due.
>
> When you were first appointed by President Wilson in 1915, very little was known about the science of aeronautics. To you and to your colleagues were entrusted by law the supervision and direction of the scientific study of the problems of flight. For the past twenty-four years you have served as chairman of the National Advisory Committee for Aeronautics, or chairman of its executive committee. The administration and the accomplishments of the committee under your leadership reflect your great scientific attainments, professional courage and executive ability.
>
> That the people generally have not known of your brilliant and patriotic service is because it has been overshadowed by your passion for accomplishment without publicity. But the fact remains, and I am happy to give you credit for it, that the remarkable progress for many years in the improvement of the performance, efficiency and safety of American aircraft, both military and commercial, has been due largely to your own inspiring leadership in the development of new research facilities and in the orderly prosecution of comprehensive research programs.

SCIENTIFIC NOTES AND NEWS

PROFESSOR GEORGE R. HARRISON, director of the Research Laboratory of Experimental and Applied Physics at the Massachusetts Institute of Technology, was presented on October 11 with the Rumford Medal of the American Academy of Arts and Sciences in recognition of "his notable work in spectrum photometry and spectrum analysis." Dr. Harlow Shapley, director of Harvard Observatory and president of the academy, presided; the presentation was made by Professor Norton A. Kent, of Boston University. Dr. Harrison made an address entitled "New Methods in Spectroscopy."

THE Frederic E. Ives Medal of the Optical Society of America was presented on October 14 at the Lake Placid meeting to Dr. August Herman Pfund, professor of physics at the Johns Hopkins University, in recognition of his work with infra-red rays. Dr. R. C. Gibbs, of Cornell University, president of the society, made the presentation.

THE seventieth birthday of Dr. R. S. Woodworth, professor of psychology at Columbia University, was celebrated on October 17. At an informal luncheon held at the Faculty Club his colleagues presented to him an anniversary volume, "Psychological Issues," containing a collection of twenty-five of his publications, a copy of his portrait and a complete bibliography. A reception was held at the Faculty Club in the afternoon from four to six where he was greeted by officers of the university, his colleagues and students in psychology.

AT a special ceremony in connection with alumni day, Colgate University on October 15 conferred the doctorate of science on William S. Murray, consulting and analytical chemist of Utica, N. Y., and a trustee of the university. President George Barton Cutten conferred the degree after Dean Carl A. Kallgren had read the citation. Mr. Murray is chairman of the New York Republican State Committee.

DR. FRANK AYDELOTTE, president of Swarthmore College, has been elected director of the Institute for Advanced Study at Princeton, New Jersey. He succeeds Dr. Abraham Flexner, who has been director of the institute since its establishment in 1930.

DR. FRANKLYN B. SNYDER, formerly vice-president and dean of the faculties, will be installed as the eleventh president of Northwestern University on November 15. He succeeds Dr. Walter Dill Scott, formerly professor of psychology, who resigned recently after serving as president since 1920.

AT the Armour Institute of Technology, Chicago, Linton E. Grinter, director of the civil engineering curriculum and dean of the Graduate Division, has been appointed vice-president of the institute. He will continue as dean of the Graduate Division.

DR. HERBERT C. SADLER, Alexander Ziwet professor of engineering at the University of Michigan, has retired because of ill health. Resolutions were adopted at a meeting of the Regents on October 7 expressing their appreciation of his services and conferring on

him the titles dean emeritus of the College of Engineering and professor emeritus of naval architecture and marine engineering.

DR. ROYAL N. CHAPMAN, director of the Pineapple Producers Association of the Agricultural Experiment Station and dean of the Graduate School of Tropical Agriculture of the University of Hawaii, has returned to the University of Minnesota as dean of the Graduate School. He takes the place of Dr. Guy Stanton Ford, now president of the university. Dr. Chapman received the degree of bachelor of arts and master of arts from the university, and was from 1916 until he went to Hawaii in 1930 associated with it as instructor, assistant and associate professor and professor of animal biology and economic entomology.

DR. CLARENCE E. BENNETT has been appointed head of the department of physics of the University of Maine; Dr. J. Robert Smyth has been made head of the newly established department of poultry husbandry in the College of Agriculture.

DR. DAVID A. BOYD, JR., instructor in psychiatry and assistant physician in the Neuropsychiatric Institute of the University of Michigan, has been appointed head of the department of mental and nervous diseases of the School of Medicine and Medical Center of Indiana University. Dr. Larue Carter has been named chairman of the division of neurology.

DR. FRITZ LONDON, of the Institute Henri Poincaré, one of the divisions of the University of Paris, has been appointed professor of chemistry at Duke University.

DR. RICHARD W. LINTON, who was engaged in research on cholera in India from 1931 to 1938 under the auspices of the Indian Research Fund Association, has been appointed assistant professor of pathology at Cornell University Medical College, New York City. Dr. Linton is carrying on research on tuberculosis.

H. W. STRALEY, III, formerly of the University of North Carolina, has been appointed associate professor and executive officer of the department of geology of Baylor University at Waco, Texas.

DR. CLINTON V. MACCOY, assistant biologist in the New Hampshire Department of Fish and Game, has been appointed assistant professor of zoology at the Massachusetts State College. He succeeds Professor Herbert E. Warfel, who has joined the faculty of the University of New Hampshire.

DR. WITOLD HUREWICZ, of the University of Vienna, is this year assistant professor of mathematics at the University of North Carolina. Other appointments include: Dr. Jonathan Williams, of Northwestern University, assistant professor of chemistry, and Dr. Harry Davis Bruner, of the University of Louisville, assistant professor of physiology. As already announced, Dr. Robert E. Coker, head of the department of zoology, has been named a Kenan professor, succeeding the late Dr. H. V. Wilson. Dr. I. H. Manning, formerly dean of the Medical School, has been named Kenan professor emeritus of physiology.

DR. LOUIS G. KRESS, of Buffalo, has been appointed the first director of the newly established Division on Cancer Control of the New York State Health Department. He will open an office in Albany to direct the statistical, clinical and educational work. Dr. Kress was director of the old departmental division of cancer control. Dr. Morton L. Levin, of New York City, has been made assistant director.

DR. ELLIOTT C. CUTLER, Moseley professor of surgery at the Harvard Medical School and surgeon-in-chief at the Peter Bent Brigham Hospital, Boston, has been elected president of the Harvard Alumni Association.

DR. JAMES H. HIBBEN, of the Geophysical Laboratory of the Carnegie Institution of Washington, has become chief of the Chemical Division of the U. S. Tariff Commission.

DR. ROBERT T. CONNER, instructor in chemistry at Columbia University, has become associated with the Biochemical Division of the General Foods Company at Hoboken, N. J.

PROFESSOR HUGH O'NEILL, of the Catholic University of America, has returned to Washington after an expedition to Labrador, to the islands north of Canada and to Hudson's Bay. Geological specimens were collected, as well as 600 cross sections of wood showing growth rates; motion pictures were taken.

DR. WILFRED H. OSGOOD, chief curator of zoology at Field Museum of Natural History, sailed from New York on October 6 for Peru, where he will assume leadership of the Magellanic expedition, sponsored by Stanley Field, president of the museum. The expedition, which includes in its personnel Colin C. Sanborn, curator of mammals, and Karl P. Schmidt, curator of amphibians and reptiles, will proceed from Peru via central Chile to the Straits of Magellan for collecting and research which will continue throughout the summer season of southern South America.

DR. THOMAS H. JOHNSON, assistant director of the Bartol Research Foundation of the Franklin Institute, lectured on October 18 at a stated meeting of the institute. His subject was "Cosmic Rays, What has been Learned About Them."

DR. WERNER E. BACHMANN, associate professor of chemistry at the University of Michigan, is lecturing during October under the auspices of the American Chemical Society. He planned to speak in sixteen

cities in Wisconsin, Minnesota, South Dakota, Montana, Washington, Oregon, California, Utah, Colorado, Nebraska and Iowa. The titles of his lectures are: "The Synthesis of Sex Hormones" and "Cancer-Producing Compounds."

DR. SOMA WEISS, Hersey professor of the theory and practice of physic at the Harvard Medical School, will give an address at a joint meeting of the Institute of Medicine of Chicago and the Chicago Society of Internal Medicine at the Palmer House on the evening of October 27. His subject will be "Syncope, Collapse and Shock-Mechanism and Treatment."

DR. DAVID SARNOFF, president of Radio Corporation of America and chairman of the board of the National Broadcasting Company, gave an address at Albany on October 13 entitled "Radio and Education" on the occasion of the seventy-fifth convocation of the University of the State of New York.

AN astronomical conference, on "The Internal Constitution of the Stars," sponsored by the New York Academy of Sciences, is being held on October 20 and 21 at the American Museum of Natural History, with Dr. Harlow Shapley, director of the Harvard Observatory, as chairman. At the morning session on October 20 there is a discussion of "The Distribution of Density in Eclipsing Binaries," at which the speakers announced are Professor Henry Norris Russell, Princeton University; Dr. Theodore E. Sterne, Harvard University, and Dr. Zdenek Kopal, Czecho-Slovakia. In the afternoon the subject is "Sources of Stellar Energy" and the speakers announced are: Dr. Hans A. Bethe, Cornell University; Dr. S. Chandrasekhar, University of Chicago, and Dr. G. Gamow, George Washington University. On Saturday, October 21, the subject announced is "Opacity Problems," and the speakers, Dr. Donald H. Menzel, Harvard University; Professor Philip Morse, Massachusetts Institute of Technology, and Dr. Jaakko Tuominen, Finland.

DISCUSSION

VOCAL MIMICRY OF THE STARLING AND THE MOCKINGBIRD

THE introduced starling and the mockingbird are unsurpassed as versatile vocal mimics among our American birds. While the mimicry of the starling is delivered in a more quiet and less spectacular manner than that of the mockingbird, it is in many respects a more skilled and persistent mimic, and its mimicry may even be more varied in its range and in its methods.

I have spent much time with starlings close at hand by means of observation boxes and nesting boxes placed near my bedroom window. The faithfulness with which the starling can imitate complex sounds is remarkable; in the proper mood its repertoire is almost inexhaustible.

There are many interesting characteristics which enter into its mimicry. First almost all sounds seem to have registered themselves in its brain at one time or another, as the fuss-and-ado made by a hen after laying an egg, the weird calls of the disturbed guinea hen, the calling of the quail, the song of the wood peewee, the mew of kittens, and many others.

Some of the more remarkable exhibitions have extended to very special notes such as the immature chirp of young robins, as well as the clearer less throaty notes of the adults. One of the most interesting renderings was the portion of a whistled song by some boy, the whistled notes being delivered with surprising clearness.

I have never yet heard the clear flute-like notes of the wood thrush attempted, although these birds are everywhere common singers in the immediate vicinity. However, this affords no criterion that some day they will not come from a starling's throat.

Every out-of-door nature student is probably familiar with the drumming notes of the woodpeckers, produced by rapid taps of the beak upon a dead limb. I was convinced that this was one note, so specialized and mechanical in its production, that the starlings would never attempt nor be able to reproduce it. I was wrong, but it took a long period of time to establish this, since for many years the birds had dwelt by my bedroom window and elsewhere in boxes in my trees, with no hint of such accomplishments. In the spring of 1938 a starling began delivering the long monotonal *clip-clip-clip* of the flicker, in its usual low voice, but perfect in its rendering, and from time to time it used its beak to drum out a low, but very clearly reproduced and accurate tattoo of this bird on the top of its box. This note was delivered from time to time for weeks, but only occasionally.

To my mind this is one of the most remarkable instances of mimicry, since it has demanded an entirely new method of mechanical sound production on the part of the bird. I am still convinced, however, that the starling, marvelous mimic that it has proven itself to be, will never reproduce the queer booming sounds of the nighthawk, which follows the termination of the high dive of this bird toward the earth with closed wings. This accomplishment should be beyond its scope and power, it would seem.

A second feature in the starling's mimicry is an out-of-season production of the notes of our summer birds. For instance, the distinctive notes of the wood peewee

for weeks have been produced in the dead of winter, months after the birds have gone far southward. In some manner these notes gleaned in summertime have been retained by the nervous mechanism of the starlings, to come out aimlessly, spontaneously, yet faithful in their vocal copy, when the starlings were in a voluble mood.

There is a third phase in the starling's mimicry which deserves mention. I refer to the persistence of a given note which will have a "run," or become a popular "hit," so to speak, over a considerable period of time, and become an element in the repertoire of a number of birds for the same period. At one time it will be the call notes of the quail, at another that of the wood peewee, then these will be abandoned, not to be heard for weeks, months or years. In this fundamental behavior, starlings are like humans, and novelty seems to have its temporary interest, but the novelty by constant repetition wears off, it would seem, and a new outlet of expression is resorted to.

The mockingbird, it may be said, is also one of our great mimics, but he is more of an original artist than the starlings. He sings loudly, loves dramatic display, as witness the conscious display he makes of the white spots in his wings as he hops along a level privet hedge with uplifted and outstretched wings, or springs up from the roof gable or chimney top in his voluble exuberance with extended wings, or sings with wild revelry the night long on moonlight nights.

Vocal mimicry may not be a simple matter. The mimic appears to plagiarize blindly, indulging in a wild and lawless flow of borrowed notes, repeating them rapidly from 2 to as many as 20 or more times, not infrequently, as the mockingbird does. It would be remarkable, indeed, if a starling or mockingbird delivered the entire song of a wood thrush in the calm, deliberate, phrased manner of this classic singer. While the individual note, call or phrase of a song may be reproduced with great fidelity, the mimic does not go so far as to reproduce the method of the song, its time relations or its structures. I may refer to the song of the common phoebe (*Sayornis phoebe* Latham). This is a simple song characterized by two phrases usually delivered in alternation in the typical song. The only obvious difference in the two phrases appear to be a lowered inflection in the one and a raised inflection at the end of the other, *i.e.*, pee-wee .... pee-wee .... pee-wee .... pee-wee, etc.

Now the mockingbird has very frequently indulged in the first phrase *pee-wee* of this series, repeating it hurriedly, with a very faithful rendering of its innovations, 10 times or more, but at no time has it ever adopted the simple song as a whole and reproduced it structurally as an alternation song which the peewee has learned to deliver. This degree of mimicry is a very different and more technical sort of attainment than the birds seem to be capable of, it would seem.

The mockingbird is very apt at times in its mimicry of the whippoorwill, but it apparently never introduces the low cluck at the end of the phrase whip-poor-will which the whippoorwill itself delivers.

While vocal mimicry has attained a high degree of development in a few of our birds, it would appear to be only a maudlin accomplishment, satisfying only to the whims and moods of the individuals of the species. In the process of accomplishment there must be some degree of attention and memory involved, even if only of a subconscious sort. Surely, also, there are profound differences in the capacities of the brain of different species to absorb the sounds which impinge upon the bird's attentions, since one species is an excellent mimic and another is not. So far as actual mimicry is concerned it is apparently an aimless and useless art, and of no survival value to the species. Nevertheless, one must admit that our great mimics among the birds are geniuses in their art.

H. A. ALLARD
U. S. DEPARTMENT OF AGRICULTURE

HIBERNATION OF ANOPHELINE EGGS IN THE TROPICS

THE methods of survival of anophelines through the dry season in Panama have caused a great deal of speculation. It is a recognized fact that a small amount of anopheline breeding continues throughout the dry season and probably a few adults survive this period, but the sudden increase in anopheline larvae and adults occurring 7 to 10 days after the onset of the rainy season does not seem to be wholly accounted for as coming from these sources. The numbers of adults and larvae encountered at this time would make one think that some other method of survival is utilized by the anophelines to tide the majority of them over the unfavorable period of the dry season.

We felt that hibernating eggs might be one of the factors involved in the survival of these species. As far as we know, the survival of anopheline eggs by hibernation has not been demonstrated in the tropics.

As the dry season was well advanced when it was decided to test this possibility, we were unable to accurately measure and study anopheline eggs being oviposited at the beginning of the dry season and compare them with eggs oviposited during the summer and fall. It is our impression, however, from observation of *Anopheles albimanus* eggs, studied superficially during the latter part of December, 1938, that they were larger than those secured during the summer. Many of these apparently larger eggs, instead of hatching in 24 to 48 hours, required 7 to 14 days to hatch, and some failed to hatch within the 14-day

observation period, although they did not appear to be unfertile.

In the Canal Zone there are many seepage areas that persist for about one month after the beginning of the dry season. These areas then dry up and no water is present in them until the rains begin in the latter part of April or the first week of May. The earth in these areas is dry and fissured, except when fallen leaves and grass cover the ground, in which case the soil is slightly moist but crumbly and will not pack when squeezed by hand.

On April 10, 1939, the superficial earth from a number of these seepage areas in the vicinity of Chiva Chiva, C. Z., was collected. It was estimated that the areas in which the collections were made had been dry for at least one month and no rains had been experienced in this area during that time. The slightly moist earth was collected, placed in sterile pans and then covered with tap water containing a small amount of hay infusion. The water and hay infusion were carefully handled and protected inside a screened building to preclude any mosquitoes gaining access to them. Two days after the addition of the water, a number of first instar Culex, Aedes, Psorophera and four anopheline larvae were present in the pans. The anopheline larvae developed out to be three *A. punctimacula* and one *A. albimanus*.

Additional samples of earth were collected in the Fort Clayton, C. Z., area on April 17 and 26, and on May 1 at Fort Davis, C. Z. The same precautions were exercised in the collection and handling of these specimens as reported for April 10. Three *A. albimanus*, one *A. tarsimaculatus* and five *A. punctimacula* larvae were recovered from these specimens.

Considering the method of collection and handling of this material, we feel that the larvae found had to come from eggs present in the moist earth collected from the dry seepage areas. These findings are insufficient to generally conclude that hibernating eggs are one of the ways that anophelines survive the dry season in the tropics, but the evidence seems to indicate it as a possibility. Careful observations and tests will be made prior to and during the 1940 dry season to determine the significance of the findings reported in this communication.

WM. S. STONE
FRANÇOIS H. K. REYNOLDS

ARMY MEDICAL RESEARCH BOARD,
ANCON, C. Z.

DISTRIBUTION OF ARTIFACTS MADE FROM CHALCEDONY OF CERRO PEDERNAL, NEW MEXICO

RECENTLY Kirk Bryan[1] has called attention to the chalcedony or chert bed on Cerro Pedernal and San Pedro Mountain in north central New Mexico. This distinctive pearl-gray chalcedony is in part flecked by red and yellowish splotches. Occasional small holes are scattered at random throughout the material.

This chalcedony seems to have been quarried and manufactured over a period from the historic past to a time of considerable antiquity. Any material as distinctive and suitable for the making of artifacts should have been carried far and have been regionally dispersed by trade.

A point of this chalcedony some 4.6 inches long and 1.5 inches wide, of the type usually considered to be a knife, has been found recently in the Moreno Valley in the Sangre de Cristo Mountains, some seventy miles east and north of the known outcrops. Three other artifacts, a broken, but large oval blade, a tanged point and an "end and side" scraper, all of "Plains" type, have been found in a collection gathered locally near Mora, New Mexico, on the eastern slope of the Sangre de Cristo Mountains.

These four artifacts are without question made from the chalcedony of Cerro Pedernal, and further examination of collections may reveal an even wider distribution of this material, which appears to have been used by Indians of both Pueblo and Plains affinities, as well as by more ancient peoples.

LOUIS L. RAY

CAMBRIDGE, MASS.

THE PRESENCE OF NON-OXYGEN-COMBINING (INACTIVE) HEMOGLOBIN IN THE BLOOD OF NORMAL INDIVIDUALS[1]

IT is generally assumed that all the hemoglobin circulating in the blood is capable of combining with oxygen and carbon monoxide, so that the capacity of the blood for oxygen absorption may be taken as a measure for the amount of hemoglobin.

It is found, however, that on employment of van Slyke and Hiller's method—after which the ability of a specimen of blood to combine with carbon monoxide (the active hemoglobin) is determined, whereafter reduction is performed with sodium hydrosulfite followed by a new determination of the carbon monoxide fixation power (the total hemoglobin)—several cases show a not inconsiderable amount of a kind of hemoglobin that is capable of binding carbon monoxide only after this reduction.*

In 82 examinations carried out on healthy persons and patients who had not taken any methemoglobin-producing remedies there was found an average amount of the above-mentioned substance corresponding to a carbon monoxide fixation of 0.64 vol. per cent. = 3.5 per cent. hemoglobin (Haldane), varying from 0–2.64 vol. per cent. (0–14.5 per cent. Hb. (Haldane)). In about two thirds of the cases the amount

[1] Kirk Bryan, SCIENCE, 87: 343–346, 1938.

[1] From the Medical Department B of the Rigshospital, Copenhagen (Physician-in-chief, Professor E. Warburg, M.D.).

this substance was less than 5 per cent. of the total mount of hemoglobin; only in a few cases (four together) did it exceed 10 per cent. of the total moglobin.

It was not practicable to identify this substance by dinary spectroscopic examination; for the present its mposition and the cause of its appearance will have be looked upon as unknown.

According to these findings, however, the so-called tive oxygen fixation power must be considered a very unreliable measure for the amount of hemoglobin. Indeed, in fourteen comparative colorimetric (Hellige's universal colorimeter) and gasometric blood examinations the colorimetric values were found to deviate considerably more from the active values than from the total.

Thus it can not be recommended to standardize colorimetric hemometers by means of the oxygen capacity.

ESTHER AMMUNDSEN

SCIENTIFIC BOOKS

MATTER AND LIGHT

Matter and Light. By LOUIS DE BROGLIE. Translated by W. H. Johnston, B.A. 300 pp. New York: W. W. Norton and Company, Inc. $3.50.

WE have here a book written by an author outstanding in his field and noted for the clarity of his expression. In these matters the volume leaves nothing to be desired.

The book can hardly be regarded as one for the general reader. While at the outset matters of interest to the layman and comprehensible to him are presented, the author soon reaches a degree of sophistication in which the subjects treated would only have significance to a physicist and, indeed, to one who had thought fairly deeply along the lines of the modern quantum theory.

The nature of the various sections is such that there is a great deal of overlapping. We do not have here one book written in an ordered sequence, but rather a number of articles dealing with more or less the same subject in different words. This has some advantages and some disadvantages. Its advantages lie in the fact that the subject is one which is developed rapidly and presents to the minds of many a picture of artificiality and abstractness. For this reason, even a repetition of the ideas in different words is helpful in gaining more complete understanding of the matter. On the other hand, the type of treatment cited is not, perhaps, the best one for a reader whose purpose is to seek an ordered development of the subject.

In conclusion, it may be said that the book ranks as a very important contribution to the literature of the subject and will be enjoyed by a fairly large group of scholars who have the necessary background to understand it.

W. F. G. SWANN

BARTOL RESEARCH FOUNDATION OF
THE FRANKLIN INSTITUTE,
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WAVELENGTH TABLES

Wavelength Tables. Measured and compiled under the direction of GEORGE R. HARRISON. xxviii + 429 pp. Boston: The Technology Press, Massachusetts Institute of Technology. New York: Wiley and Sons, Inc. London: Chapman and Hall, Ltd. 1939. $15.00.

THE book comprises a systematic survey of spectrum lines giving intensities in arc, spark or discharge tube of more than 100,000 spectrum lines most strongly emitted between 10,000 and 2,000 A by the atomic elements under normal conditions of excitation. The measurements and compilation have been made under the direction of Professor George R. Harrison by staff members of the spectroscopy laboratory of the Massachusetts Institute of Technology, assisted by the Works Progress Administration.

There is a clearly written introduction summarizing the scheme of the book, and the notation, and dealing with several other matters such as the precision of the wavelengths, the nature of the apparatus used in the Massachusetts Institute of Technology observations, sources of error, etc.

There is a table stating the numbers of lines included for the various elements, a table giving the sensitive lines of the elements compiled from combinations of empirical and theoretical data selected from the literature, the lines being listed according to the elements. Then follows a table in which the aforesaid sensitive lines are arranged in order of wavelengths. Next comes a key to the symbols for authors and references, and finally what comprises practically the whole volume of the book, a table of the lines in order of wavelengths extending over the ranges already cited.

The material is set forth in a clear form, and the volume is of a size such as to provide for absence of crowding and for convenience of handling. The work will undoubtedly be found of great value to those working in both the pure and applied fields of spectroscopy.

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MAGNETISM

Modern Magnetism. By L. F. BATES. ix + 340 pp. Cambridge: at The University Press. New York: The Macmillan Company. 1939. $4.50.

IN many universities, the study of the magnetic properties of matter is not strongly emphasized, and the study of the experimental work in this field is almost totally neglected. This volume by Professor Bates, of the University College, Nottingham, is particularly welcome to both the student and the teacher for its presentation of much material which is unavailable except in the original publications. Although written primarily from the experimental point of view, the underlying theory is not neglected, and the work is by no means a mere compilation of observations. Proceeding from definitions of elementary quantities with no attempt to discuss the subtleties here involved, a rapid survey is made of atomic structure in terms of the vector model, and of the elementary theories of susceptibility. This is followed by descriptions of the methods of magnetic measurements and a review of the results of susceptibility measurements on isotropic and crystalline material. The measured susceptibilities are tabulated together with the electronic structures of the elements. It is unfortunate that references to the sources of the quoted values are not given. The chapters on atomic beams and nuclear spins and magnetic moments are interesting, particularly in view of the fundamental theoretical significance of the results. After a description of the several gyromagnetic effects, the volume closes with three chapters which summarize the experimental results involving the complicated phenomena of the behavior of the ferromagnetic domains, the energy changes and magnetostriction. In view of the enormous complexity and our lack of complete understanding of these phenomena, this portion of the volume is as well organized and digested as is possible without adding considerably to the length and detracting from the book's usefulness. The volume has both name and subject indices and a particularly complete table of contents, making it p sible to locate any subject with ease.

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RADIOACTIVITY

A Manual of Radioactivity. By GEORGE HEVESY a F. A. PANETH. Second edition, xvi + 306 pp., tra lated by Robert W. Lawson. Oxford Univers Press. 1938. $5.50.

ALTHOUGH this is designated as the second editi it is in reality the fourth, since extensive revision done each time the volume was translated into Engli The merit of this excellent text-book has been m enhanced by the inclusion of the recent rapid advan in the field, and a revision of the older material conformance with modern concepts. Chapters h been much enlarged or new chapters added which d with positrons and neutrons, artificial radioactivi the transmutation of the elements, the use of rad active materials as indicators and so forth; and appendix describing the cyclotron has been add The volume suffers, as did indeed the former editio from attempting to cover so large an amount of ma rial in a relatively short space. But this ambiti program is precisely what renders the work most u ful. Besides the physical aspects of radioactivity, relations to the fields of chemistry, geology and ev biology are outlined, and these relationships form structure which it is possible to embellish with all t details and elaborations which the lecturer cares add. Sufficient references to other works and original papers are provided. The work of the tra lator has been well done. As a whole, the volume is worthwhile addition to any library.

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SPECIAL ARTICLES

THE PATHOGENIC ACTION OF PHYMATOTRICHUM OMNIVORUM

CYTOLOGICAL studies[1] of cotton roots attacked by *Phymatotrichum omnivorum* (Shear) Duggar have presented indirect evidence of the importance of chemical action in the process of parasitism by this fungus. The data from cytological preparations were not accompanied, however, by experimental evidence of the type so well known for various fungi that cause rotting of plant tissues.[2] Henderson[3] has describ toxic action on cotton seedlings by thermostable su stances in filtrates from cultures of the fungus liquid media. She found that the decreased path genicity resulting from continued culture on artifici media tends to be regained after growth upon a sui able living host. In the present work pure cultur of the fungus have been maintained in successi

[1] G. M. Watkins, *Amer. Jour. Bot.*, 25: 118–124, 1938; *Phytopath.*, 28: 195–202, 1938.

[2] Summary by W. Brown, *Bot. Rev.*, 2: 236–281, 1936.

[3] L. Henderson, *Amer. Jour. Bot.*, 24: 547–552, 1937.

nsfers on roots of living cotton seedlings. When a gment of infected root was placed against the root a healthy seedling, it usually caused within a few rs a shrinking and discoloring of adjacent host sues. This was followed by the formation of an ireling and penetrating hyphal weft, which pro- ed within two or three weeks a thoroughly soft ay of the cortex along the entire root system. The mediately destructive action observed in such cases, urring before penetration had been accomplished, ggested that a transfer of tissue-destroying sub- nces from rotted to healthy roots had taken place, led the writers to test the action of hyphal exudates art from the fungus. It was found that small pieces decayed roots, when squeezed with forceps, generally ld one or two drops of clear, amber-colored liquid. one series of tests this fluid was applied directly, the form of drops, to the surfaces of normal cotton dling roots; in a parallel series healthy roots were ated with drops of liquid expressed from decayed ts which had been subjected to the temperature of ling water for one hour. Similar tests were made the action of liquid pressed from germinating erotia which had been formed on nutrient agar hout access to host tissue. Special care was taken avoid mechanical injury to the healthy roots and to intain aseptic conditions throughout all experi- nts.

Liquid from unheated, decayed roots was usually sorbed into healthy roots in 4 or 5 hours, and fre- ently imparted a moist, water-soaked appearance to tissue at the points of application. After 24 hours tissue thus affected had begun to shrink and turn llow or light-brown, forming sunken necrotic areas ich resembled the lesions caused by the fungus on ts of young cotton seedlings. In most cases the rinkage progressed around the root and extended mewhat longitudinally until the root appeared to be rdled or ringed almost to the central cylinder. After ree or more days a number of small lateral roots gan to break through the necrotic cortex, which sug- sts that the tissue destruction did not extend beyond e endodermis. Stained sections of roots fixed in dif- rent stages of cortical necrosis show a gradual dis- ganization of protoplasts, followed by swelling and stortion of cell walls from the epidermis inward. inally the epidermis and cortex collapse into a deeply aining, disorganized mass, which shrinks toward the ndodermis. Simultaneously, abundant cell division in e pericycle initiates the formation of lateral roots.

Cotton roots treated with liquid expressed from eated decayed roots reacted in a different manner; e liquid was not absorbed as readily, and usually only slightly discolored spot resulted. No considerable rinkage or disruption of tissue continuity was ob- erved, although sections of the treated roots show that toxic effects had been exerted on protoplasts near the places of application. The experiments with unheated and heated liquid from germinating sclerotia gave results closely parallel to those described above.

Attempts to recover the fungus by placing on nutrient agar various samples of roots to which unheated fluid had been applied failed, and sections of such roots show no mycelium. Both of these circumstances tend to indicate that viable hyphae are rarely, if ever, transferred with the expressed drops of liquid, and that the induced lesions resulted from the activity of fungous secretions. The consideration that the lesions might have been brought about by possible toxic products of the chemical breakdown of host tissues is minimized by the fact that similar lesions resulted from the application of unheated liquid from germinating sclerotia. The demonstration of chemical action as an important factor in the pathogenic mechanism of *P. omnivorum* is of interest in connection with biochemical studies of the basis of resistance in certain plants to the root rot caused by this fungus.[4,5]

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URINE CHLORIDE CONCENTRATION IN PATIENTS WITH CUSHING'S SYNDROME

McQuarrie, Johnson and Ziegler[1] and Anderson, Haymaker and Joseph[2,3] recently reported changes in the serum electrolyte pattern and urinary excretion of sodium and potassium in patients with Cushing's syndrome that were in most respects diametrically opposite to those in patients with Addison's disease. These findings, together with the observation[2] that extracts of the blood of such patients prolonged the lives of adrenalectomized rats, suggested that Cushing's syndrome may be dependent upon or associated with a state of hypercorticoadrenalism.[1,2]

Cutler, Power and Wilder[4] have demonstrated that under standardized conditions of low sodium and chloride and high potassium intake the presence of supernormal concentrations of sodium or chloride in the urine is suggestive of a state of adrenal cortical insufficiency. Theoretically, the opposite condition should obtain in hypercorticoadrenal states under conditions of high sodium and chloride intake. The fol-

[4] G. A. Greathouse, *Phytopath.*, 28: 592–593, 1938; *Amer. Jour. Bot.*, 25: 743–748, 1938.

[5] The senior writer's share of this work was done during his tenure of a National Research Fellowship in Botany, 1938–39.

[1] I. McQuarrie, R. M. Johnson and M. R. Ziegler, *Endocrinol.*, 21: 762, 1937.

[2] E. Anderson, W. Haymaker and M. Joseph, *Endocrinol.*, 23: 398, 1938.

[3] E. Anderson and W. Haymaker, *Proc. Soc. Exper. Biol. and Med.*, 38: 610, 1938.

lowing procedure was adopted: The basic diet was identical with that employed in the procedure outlined by Cutler *et al.*,[4] containing 0.949 gm Cl, 0.592 gm Na and 4.062 gm K daily. On the first day of the study period the fluid intake was fixed at 20 cc per kilogram of body weight, and 10 gm of NaCl (in capsules) was given with the morning and again with the evening meal. The same régime was followed on the second day. On the third day the bladder was emptied at 8 A.M. and urine was collected for the subsequent four-hour period. On this day 5 cc of fluid per kilogram was given before 11 A.M. Under these conditions, the intake of Na and Cl on each of the first two days was approximately 8.6 and 12.95 gm, respectively.

Of the several chemical studies performed during the test period, I wish to mention here only the chloride concentration in the four-hour urine specimen obtained on the morning of the third day. Sixteen subjects were studied. Three of these were patients presenting the characteristic clinical picture of Cushing's syndrome, with normal urinary findings and normal renal function (urea clearance); one was a patient with excessive hirsutism; the remainder were patients with miscellaneous diseases, including rheumatic fever, convalescent, afebrile (2 cases), mild essential hypertension with normal renal function (2 cases), hypertrophic arthritis (2 cases), bronchial asthma (2 cases), maxillary sinusitis (1 case) and inguinal hernia (2 cases).

In the three subjects with Cushing's syndrome the Cl concentrations were 0.193, 0.243 and 0.357 per cent., respectively, with urine volumes of 475, 450 and 500 cc. The corresponding values in the patient with excessive hirsutism were 0.179 per cent. and 535 cc. In the twelve subjects with miscellaneous disorders with no evidence of endocrine dysfunction the Cl concentration ranged from 0.462 to 1,265 per cent. (mean 0.642) and the urine volume from 680 to 1,120 cc. It appears, therefore, that under the conditions of the experiment the subjects with Cushing's syndrome and with hirsutism (suspected hyperadrenalism) were unable to eliminate chloride in the urine in as high concentration as subjects with various disorders not apparently associated with endocrine dysfunction. This test procedure may prove to be of value in detecting states of hypercorticoadrenalism. It must be kept in mind, however, as demonstrated by Thorn and Harrop,[5] that various sex hormones may exert an effect upon the urinary excretion of sodium, chloride and potassium similar to that exerted by the adrenal cortical hormone.

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[4] H. H. Cutler, M. H. Power and R. M. Wilder, *J. A. M. A.*, 111: 117, 1938.
[5] G. W. Thorn and G. A. Harrop, SCIENCE, 86: 40, 1937.

ESSENTIALITY OF PRIMARY AMINO GROUPS FOR SPECIFIC ACTIVITY OF THE LACTOGENIC HORMONE[1]

THE primary amino groups are essential for the action of the protein hormone of pituitary origin which stimulates the formation of the pigeon crop gland. We have recently demonstrated this by treating the lactogenic hormone with ketene.[2] Philpot and Small[3] have shown that nitrous acid resembles ketene in first attacking the primary amino groups in the protein molecule. They found that on the treatment of pepsin with nitrous acid, nitrogen liberation was complete within one half hour and that the secondary reaction—diazo compound formation—was scarcely started by this time.[4]

TABLE 1

EFFECT OF NITROUS ACID ON LACTOGENIC HORMONE*

Conditions of treatment	Total dose/squab (intramuscular) mg	Number of 30-day-old pigeons	Crop gland reaction
Untreated	1.0	3	Pronounced
22–23° C, 30 minutes.	1.0	3	Negative
	2.0	3	Negative
0° C, 30 minutes	1.0	3	Negative
	2.0	3	Negative
	1.0	3	Negative

* L 250: potency, 10 systemic units per mg.

It therefore seemed desirable to treat lactogenic hormone with nitrous acid in an effort to confirm the findings with ketene. A 1.5 per cent. solution of a highly purified lactogenic preparation was dissolved in 0.5 M acetate buffer (pH 4) and was treated for 30 minutes with an equal volume of 2 M $NaNO_2$ at 22° C. and 0° C. The mixture was then adjusted to about pH 5, was centrifuged, and the precipitate was redissolved and reprecipitated isoelectrically. As can be seen in the table, the crop stimulating activity of the preparation was completely destroyed by nitrous acid in this period. The results therefore confirm those obtained with ketene, indicating the essentiality of the

[1] Aided by grants from the Research Board of the University of California, from the Rockefeller Foundation of New York and from Parke, Davis Company of Detroit. Assistance was rendered by the Federal Works Progress Administration, Project OP 665–08–3–30, Unit A-5.
[2] C. H. Li, M. E. Simpson and H. M. Evans, SCIENCE, 90: 140, 1939.
[3] J. St.L. Philpot and P. A. Small, *Biochem. Jour.*, 32: 542, 1938.
[4] This specific action of nitrous acid has recently been confirmed by us in a study of the gonadotropic hormones. Pituitary follicle stimulating hormone, interstitial cell stimulating hormone and pregnant mare serum are inactivated quickly (one half hour) by nitrous acid, whereas human chorionic gonadotrophin is only inactivated *very slowly*. The same results were secured with ketene. (To be published).

primary amino groups in the physiological activity of lactogenic hormone.

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MULTIPLE NATURE OF THE RAT "FILTRATE FACTOR"—A COMPONENT OF VITAMIN B_2[1]

IN our attempt to purify the "filtrate factor,"[2] a dietary component of vitamin B_2 essential for rat growth, we have obtained evidence that this factor must consist of at least two entities, one of which is extractable from acid solution by diethyl ether; the second factor remains in the residue.

The methyl alcohol soluble fraction from cane molasses was adsorbed on fuller's earth. The filtrate was acidified and extracted for 72 hours with ether in a continuous extractor (Preparation I). The residue was subjected to a second 72-hour extraction (Preparation II). These extracts, as well as the residue (Preparation III), were fed to female rats maintained on a vitamin B complex-deficient diet supplemented with thiamin, riboflavin and a source of B_6 in the form of a wheat germ eluate. Each preparation was fed for 56 days at the equivalent of 3 gm daily of the original molasses. The gain in weight (above that of the controls) was: Preparation I, 60 gm; Preparation II, no gain; Preparation III, 58 gm.

At this point it may be noted that black, gray and hooded rats receiving Preparation I exhibited no change in pelage coloring, while those receiving Preparation III showed a marked graying of black hair and a lightening of gray hair, although the nutritive state and growth were essentially the same in groups I and III. This experiment was repeated with new preparations and again the graying was observed in the rats receiving the residue and the coat was normal in those receiving the ether extractable fraction, although again growth was comparable in both groups. The graying of fur in "filtrate factor"-deficient rats was first noted by Morgan, Cook and Davison[3] and by Lunde and Kringstad.[4] The present work would seem to indicate that the "anti-graying" activity goes with the ether extractable component of the "filtrate factor."

The evidence for a relationship between the "chick anti-dermatitis factor" and the "rat filtrate factor" is conflicting. Woolley *et al.*[5,6] and Jukes[7,8] have demonstrated that pantothenic acid (Williams) is the "chick anti-dermatitis factor."

Hoffer and Reichstein[9] and Subbarow and Hitchings[10,11] have shown that the fraction extracted with ether is in all probability pantothenic acid and is a component of the rat "filtrate factor"; however, El Sadr and co-workers[12] found that β-alanine did not replace the liver or yeast "filtrate factor." Woolley *et al.*[5] have reported that the "chick anti-dermatitis factor" is readily destroyed by alkali. We have prepared an iso-amyl alcohol extract from a rice bran preparation. Its activity was not destroyed by heating in 1 N NaOH solution at 100° C. for 1 hour. It would, therefore, appear that the factor extractable with iso-amyl alcohol is not identical with the "chick anti-dermatitis factor."

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[1] Aided by grants from the Board of Research and the College of Agriculture, University of California, from the Rockefeller Foundation, New York, and from Merck and Company, Inc., Rahway, New Jersey. Assistance was rendered by the Federal Works Progress Administration, Project OP 665–08–3–30, Unit A-5. The following materials were generously contributed: Betabion (Thiamin) by Merck and Co., Riboflavin by Hoffmann-LaRoche, molasses by Waialua Agricultural Co., courtesy of Mr. John Midkiff, wheat germ by General Mills, Inc., and rice bran extract by the Galen Company.

[2] S. Lepkovsky, T. H. Jukes and M. E. Krause, *Jour. Biol. Chem.*, 115: 557, 1936.

[3] A. F. Morgan, B. B. Cook and H. G. Davison, *Jour. Nutr.*, 15: 27, 1938.

[4] G. Lunde and H. Kringstad, Avhandl. Norske Videnskaps. Akad. Oslo I, Mat. Naturv. Klasse 1, 1, 1938.

[5] D. W. Woolley, H. A. Waisman and C. A. Elvehjem, *Jour. Am. Chem. Soc.*, 61: 977, 1939.

[6] D. W. Woolley, H. A. Waisman and C. A. Elvehjem, *Jour. Biol. Chem.*, 129: 673, 1939.

[7] T. H. Jukes, *Jour. Am. Chem. Soc.*, 61: 975, 1939.

[8] T. H. Jukes, *Jour. Biol. Chem.*, 129: 225, 1939.

[9] M. Hoffer and T. Reichstein, *Nature*, 144: 72, 1939.

[10] Y. Subbarow and G. H. Hitchings, *Jour. Am. Chem. Soc.*, 61: 1615, 1939.

[11] G. H. Hitchings and Y. Subbarow, *Jour. Nutr.*, 18: 265, 1939.

[12] M. M. El Sadr, H. G. Hind, T. F. Macrae, C. E. Work, B. Lythgoe and A. R. Todd, *Nature*, 144: 73, 1939.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN ELECTRIC STERILIZER FOR THE CULTURE ROOM

To avoid the use of an open flame in culture room or transfer case a small electric sterilizer has been used for a number of years and found to be highly satisfactory. The constant heating of the culture space resulting from the use of a gas jet or an alcohol lamp; the resulting convection currents of air carrying con-

taminating spores; the production of harmful gases and the fire hazards are all eliminated by substituting a low rectangular frame of transite containing a number of turns of nicrome wire connected to the lighting circuit.

The details of the sterilizer are given in the accompanying sketch (Fig. 1). When using the sterilizer a pedal switch operates to turn the electric current on

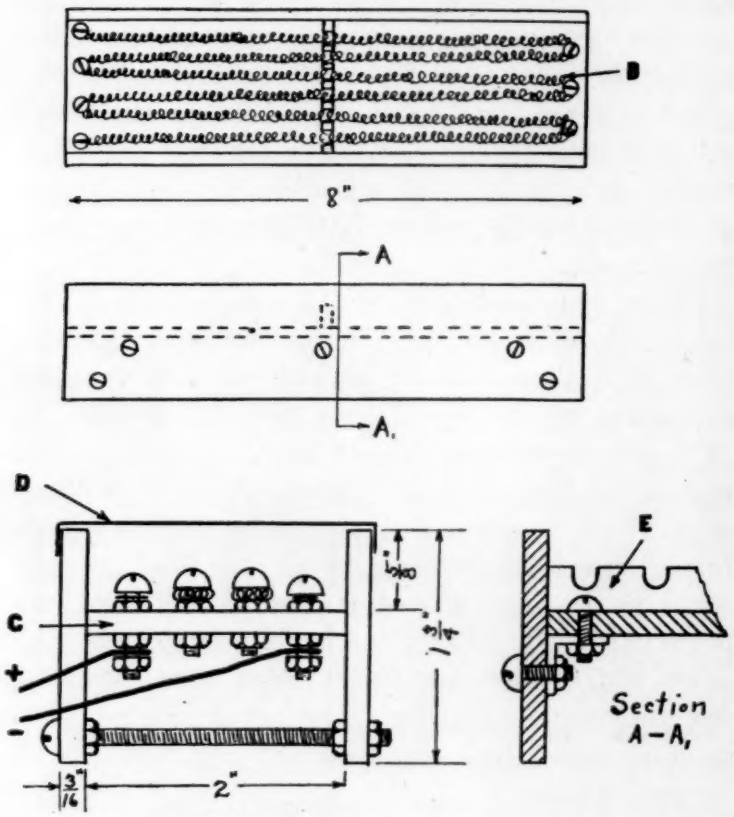

FIG. 1. Electric sterilizer, showing frame of 3/16" transite which bears the coils of resistance wire B on a shelf C. The "12 to the inch" mesh galvanized wire screen D, covers the frame, prevents direct contact with the heating coil B and is used to hold various cultural instruments such as wire needles, special knives, scalpels, chisel forceps, long museum forceps and other instruments and materials during sterilization. In B the length of resistance wire from a cone-heating unit is looped around binding bolts at both ends and supported in the center by a slotted strip of transite E to prevent lateral contact between segments of the coil.

and off, keeping the heating coil hot only during the period when the culture instrument is being held over the mesh screen. The instrument is first dipped in alcohol and either held momentarily over the screen or laid upon it until the alcohol ignites and burns off. Glass rods used in special cultural technique for testing toxicity of preservatives in wood can be dipped in alcohol and a number of them placed over the screen for sterilization before placing them on the test fungus mat. The sterilizer is placed on a sheet of asbestos paper laid on the culture room table or the floor of the culture case in a position most handy for the worker.

The electric sterilizer is submitted for trial to those workers who desire, for one reason or another, to eliminate the open flame in the culture chamber.

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THE INFLUENCE OF CENTRIFUGATION ON THE AGGLUTINATION OF PNEUMOCOCCI[1]

THE usual methods for detecting agglutinins (excepting the relatively crude slide agglutination), require 18–24 hours. Fleming,[2] stimulated by earlier observations of Gaehtgens[3] and of Gates,[4] employed centrifugation.

It was observed during observations on antigen-antibody balance in treated cases of pneumococcal pneumonias that centrifugation increases the rapidity and accuracy of agglutinin detection.

One half cc portions of the different antibody dilutions were mixed with 0.5 cc portions of bacterial suspensions. Readings were made after ½, 1 and 2 hours' incubation at the following temperatures: 4° C., 20° C., 37° C. and 55° C. and again after refrigeration at 4° C. overnight. The results obtained by this method were compared with those observed after immediate centrifugation of the antigen-antibody mixture for 5 minutes at 2,000 r.p.m. Immediate development of strongly positive reactions were observed in all tubes after centrifuging for 5 minutes. Reactions were always more definite than those obtained with water bath incubation for two hours and overnight refrigeration. The "inhibition-zone," observed after incubation in the water bath in tubes containing an excess of antibody, was eliminated.

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[1] From the Medical Service of Harlem Hospital, Department of Hospitals, New York City, N. Y., and from the Littauer Pneumonia Research Fund, New York University College of Medicine. These studies received financial support from the Littauer Pneumonia Research Fund, of New York University College of Medicine, from the Metropolitan Life Insurance Company and from Mr. Bernard M. Baruch, Jr., Miss Belle N. Baruch and Mrs. H. Robert Samstag.

[2] A. Fleming, *British Jour. Exp. Path.*, 8: 231, 1928.

[3] W. Gaehtgens, *Munch. med. Woch.*, 53: 1351, 1906, and *Arch. Hyg.*, 56: 377, 1908.

[4] F. K. Gates, *Jour. Exp. Med.*, 35: 63, 1922.

BOOKS RECEIVED

BALL, ALICE M. *Compounding in the English Language.* Pp. 226. Wilson.

Science Reports of the Tôhoku Imperial University. Fourth Series. (Biology.) Vol. XIV, Nos. 2 and 3. Pp. 121–326. Illustrated. Maruzen, Tokyo.

TAYLOR, JAMES H. Vector Analysis. Pp. ix + 180. Prentice-Hall. $2.85.